Heavy ions doping coupled with metallic nanoinclusions: An effective way to improve the thermoelectric performance of p-type layered cobalt oxide materials

Van Nong, Ngo; Pryds, Nini; Linderoth, Søren; Ohtaki, Michitaka

Published in:
Abstract book

Publication date:
2011

Document Version
Publisher's PDF, also known as Version of record

W1.4 Heavy ions doping coupled with metallic nanoinclusions: An effective way to improve the thermoelectric performance of p-type layered cobalt oxide materials

Ngo Van Nong[1], Nini Pryds[1], Søren Linderoth[1] and Michitaka Ohtaki[2]

[1]Fuel Cells and Solid State Chemistry Division, Risø National Laboratory for Sustainable Energy, Denmark Technical University, 4000 Roskilde, Denmark
[2]Department of Molecular and Material Sciences, Interdisciplinary Graduate School of Engineering Sciences, Kyushu University, 816-8580 Japan

Intensive efforts over the past few years to develop oxide polycrystalline thermoelectric materials have led to decisive progress in this area and recently, the highest ZT value for n-type polycrystalline state-of-the-art bulk oxide was achieved with ZT of 0.65 at 1247 K [1]. However, the performance of p-type polycrystalline oxides still remained at a relatively low level.

We have proposed an effective way to improve the thermoelectric performance of layered-structured oxide materials by carefully choosing heavy ion doping and introducing metallic nano-inclusions. A p-type layered-cobalt thermoelectric oxide with remarkable high improved ZT, which reached 0.61 at 1118 K [2], was successfully fabricated using this approach. We were also able to show for the first time that the excellent chemical and thermal stability of this material remains the same over a long period of testing time, suggesting a very promising oxide thermoelectric material for high temperature power generation.

[1] M. Ohtaki, K. Araki, K. Yamamoto, J. Electron. Mater. 2009, 38, 1234.
[2] Ngo Van Nong, Nini Pryds, Søren Linderoth and Michitaka Ohtaki, Adv. Mater. (2011), in press.